

# The Future Antiarmor Capabilities Of The Ground Combat Element

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SUBJECT AREA - Strategic Issues

## EXECUTIVE SUMMARY

Title: The Future Antiarmor Capabilities Of The Ground Combat Element.

Author: Major William H. Callahan Jr., United States Marine Corps.

Thesis: The Ground Combat Element's (GCE's) Light Antitank Weapon (LAW) and Medium Antitank Weapon (MAW) capabilities are sufficient to counter the current and future armor threat. However, the GCE's Heavy Antitank Weapon (HAW) capability is inadequate because of a lack of command and control (C2) within the organizational structure. Besides the current deficiencies in organizational structure, the absence of a research and development program create a dilemma for the future HAW capability in the GCE of the Marine Expeditionary Force (MEF).

Background: Potential adversaries may be armed with an inventory of modern, highly lethal and sophisticated weapon systems including a formidable tank threat reflecting US and NATO technology. Future conflict of any spectrum will still have armor as the decisive force in ground combat. Free trade and open armor market competition have created a mix-and-match technology main battle tank with drastic improvements in survivability. Many countries have acquired these tanks in large quantities.

In recent years, force reductions have caused the Marine Corps to reduce C2 structure without considering the repercussions of the absence of this structure as it applies to readiness and employment. The GCE's future LAW and current HAW structures provide excellent examples of this situation. The cost of future technology forced the Marine Corps to take a "bare bones" approach to acquire and field the GCE's future antiarmor capability. This approach created a large void in the future HAW capability of the GCE. The GCE in future conflict must have the

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capability to defeat large quantities of advance technology main battle tanks with drastic improvements in survivability. Currently, the Marine Corps can not counter this threat when one specifically analyses the C2, survivability and lethality of the current HAW capability within the GCE.

Recommendation: To overcome current command and control problems in the HAW capability the Marine Corps needs to consolidate (TOW) within the GCE. The reorganization of TOW into one unit will increase readiness, standardize training, and be cost effective. My proposal is to reconstitute Anti-Tank (TOW) Company at the same time the Marine Corps fields the Javelin weapon system. In 1997, once fielding of the Javelin is complete; there will be four platoons of TOW in the division. These will be the three platoons located in the regiments and a platoon located in the tank battalion (The TOW section structure located in the infantry battalion will be utilized to employ Javelin). The company structure should be T/O 4235M with an additional platoon (Annex A).

To correct the dilemma in the future HAW capability, the Marine Corps should pursue a joint acquisition with the Army to develop and field Extended Range Javelin (ER Javelin) as the replacement for TOW. Joint acquisition and fielding of ER Javelin are the cost effective means to ensure the lethality and survivability required on the future battlefield. Since the Marine Corps fights as a MAGTF, the Marine Corps concurrently should establish a joint research and development program with the Army to develop a kinetic energy missile known as Line-of-Sight Antitank (LOSAT) and a 120mm mortar round known as Non Line-of-Sight Antitank (NLOS). These systems overwhelming lethality counter all current and projected armor defenses ensuring a technological advantage for the future MAGTF.

"In the world's littorals, America's global economic interests, maritime lines of communications and treaty obligations intersect with growing instability. This instability is characterized by limited resources, growing population and expansionist oriented leaders."1 World supplies of modern, lethal weapons systems will be more than adequate to meet the demands of ambitious regional

leaders. Potential adversaries may be armed with an inventory of modern, highly lethal and sophisticated weapon systems including a formidable tank threat reflecting US and NATO technology. Marine Expeditionary Forces must prepare to fight the full spectrum of war as part of a Naval Expeditionary Force, Joint Force or Coalition Force. To accomplish this mission, the Marine Expeditionary Force (MEF) must retain the advantage in battlefield technology specifically in mobility, firepower, and information to meet the threat of the future.

This paper explores the topic of firepower, specifically the antiarmor capability the Ground Combat Element (GCE) of the MEF requires to destroy modern armor now and in the immediate future. Immediate future is defined as 1995 to the year 2015. The GCE's Light Antitank Weapon (LAW) and Medium Antitank Weapon (MAW) capabilities are sufficient to counter the current and future threat. However, the GCE's Heavy Antitank Weapon (HAW) capability is inadequate because of a lack of command and control (C2) within the organizational structure. To overcome current command and control problems in the HAW capability the Marine Corps needs to consolidate the Tube-Launched, Optically tracked, Wire command link (TOW) units within the GCE. The reorganization of TOW into one unit will increase readiness, reduce current Structure, and be cost effective.

Besides the current deficiencies in organizational structure, the absence of a research and development program create a dilemma for the future HAW capability in the GCE. To correct this dilemma, the Marine Corps should pursue a joint acquisition with the Army to develop and field Extended Range Javelin (ER Javelin) as the replacement for TOW. Concurrently, the Marine Corps should establish a joint research and development program with the Army to develop a kinetic energy missile known as Line-of-Sight Antitank (LOSAT) and a 120mm mortar round known as Non Line-of-Sight Antitank (NLOS). These systems overwhelming lethality counters all current and projected armor defenses ensuring a technological advantage for the future Marine Air- Ground Task Force (MAGTF).

As the Cold War ended, most people thought that the massive armor threat would diminish. On the contrary, the opposite has occurred. The open and competitive nature of free trade in the world caused many countries to sell aggressively military hardware and technology to the highest bidder. Main Battle Tanks (MBTs) such as the Russian T-80U, the French LeClerc, the German Leopard II and the US M1A1/2 (without special armor) are available for purchase like any commodity. Many countries have acquired these tanks that are considered the world's best. "The United Arab Emirates (UAE) recently held a competition among the T80U, M1A2 and the LeClerc. As a result of this competition, UAE opted to purchase 436 LeClerc over the next five years."<sup>2</sup> "Similarly, Sweden recently held a competition among the LeClerc, the M1A2 and the Leopard II which resulted in the purchase of a number of Leopard II tanks."<sup>3</sup> This type of armor acquisition will continue in the future creating a diversified and potent armor threat throughout the world.

Another interesting result of the open armor market competition is the ability of the purchasing country to dictate design changes not considered by the selling country. "UAE bought 425 Russian BMP-3 infantry fighting vehicles. What is specifically unique about this sale is that before delivery UAE had Russia install a French designed and manufactured thermal imager which significantly upgrades the night fighting capability from the Russian version."<sup>4</sup> Another example transpired in South Africa South Africa purchased a number of T-72 Ms and added an upgraded weapons control system that includes thermal imager and a commander's station panoramic sight. Again, these modifications significantly improve the fighting capability from the Russian version. South Africa currently exports this vehicle to other countries. This mix-and-match technology trend will continue because of the cost of research and development to design and field new weapon systems. Reduced defense budgets have caused most countries to buy existing weapon systems with modification upgrades.

Another great concern is the quantities of tanks countries are buying. Saudi Arabia just bought more M1A2's than the entire US military owns. Egypt is entering into co-production of the M1A1

tank. In theory, we are helping our allies, but in 1848 Lord Palmerston said, "We have no eternal Allies and we have no perpetual enemies." In today's quickly changing political world, a US ally today could be a US enemy tomorrow. US forces, especially the MEF because of its expeditionary nature, needs to have an antiarmor capability that can defeat large quantities of the mix-and-match technology MBTs of any potential adversary.

To add to the large quantities of mix and match MBTs, Russia fielded a first generation active armor system called "Drozd" in the late 1980's. "Active protection works by detecting the launch or presence of an incoming Anti-Tank Guided Missile (ATGM) or rocket, tracking the ATGM and then shooting the ATGM down before it can hit the tank."<sup>5</sup> Initially, "Drozd" covered only the frontal 60 degrees of the tank and offered no protection against top attack (fly-over, shoot down). The Russians developed a second generation system called "Arena". "Arena" offers 360 degree protection against attack including top attack ATGMs. Several countries, including the US, have tried to acquire this technology but Russia remains the leader in this technology and is actively marketing "Arena". Any tank or armor fighting can install active protection. Active protection is substantially cheaper and more effective than any alternative upgrade in armor survivability. This technology undoubtedly will proliferate world wide within this decade. If "Arena" is as good as Russia claims it will defeat every antiarmor missile in our current inventory.

Russia and Israel simultaneously introduced Explosive Reactive Armor (ERA) in the early 1980's. Many experts originally thought Russia had stolen and copied Israel's technology. Further investigation determined Russian ERA was completely different in design from Israel ERA. Russian ERA made all western ATGMs obsolete and resulted in the development and fielding of the tandem shaped charge warhead such as TOW2A. "Recently, Russia developed a second-generation ERA which the Russians claim is effective not only against tandem shape charge warheads but also some kinetic energy rounds as well."<sup>6</sup> This second-generation ERA appeared on Slovak Republic T72 M1 tanks along with an upgraded thermal sight. Malaysia

bought the improved T72 M1 in large quantities. To defeat this type of ERA the Marine Corps requires a top attack warhead such as TOW2B and the Predator.

"Besides countering the substantial improvements in the survivability of the projected armor threat, the future development of the tank cannon (140mm gun) and tank ammunition will extend the maximum effective range of the future tank to over 4000 meters (m). This is a great improvement over the current maximum effective range of 1800-2000 m. TOW currently has a maximum effective range of 3200-3400 m which gives a TOW gunner a survivability standoff range of 1200-1400 m. The 140mm cannon will eliminate the survivability standoff range of the TOW weapon system"<sup>7</sup>.

Proliferation of conventional weapons to include modern, technologically advanced armor will continue. Armor forces will retain their status as the decisive force in ground combat. The future battlefield will have a large quantity of mix-and-match technology MBTs with drastic improvements in survivability. Free trade and open armor market competition give any country the opportunity to buy the best tanks in the world. The GCE in future conflicts, must be capable of defeating this threat.

To defeat this threat, the future HAW antiarmor capability must be a system that increases survivability of the crew. To increase survivability of the crew, the replacement system must have a maximum range of 4-6 kilometers (k), incorporate Focal Plane Array (fire and forget technology) and have a soft launch capability (reduced backblast signature). This system must incorporate the latest technology in counter missile capability (duel profile attack) and have a modular design to provide lethality modifications to address projected threat modification in protection. The Marine Corps must acquire a combination of HAW systems to integrate into the MAGTF a capability to counter the large quantities of armor expected on the future battlefield.

To describe the current and future antiarmor capability of the GCE, I will classify these capabilities into three categories: Light Antitank Weapon (LAW), Medium Antitank Weapon (MAW) and Heavy Antitank Weapons (HAW). Many doctrinal sources have described this three

tiered concept in a variety of ways. Some refer only to the weight of the weapon system others to the range or lethality of the weapon system. Technology has now crossed the spectrum in the areas of weight, lethality and range. I will define these categories to encompass this new technology.

LAW is a system that weighs less than 30 lbs. (man portable), has a range from 300 m - 1 k and can destroy MBTs with upgraded protection features. MAW is a system that weighs between 30 and 75 lbs. (man portable with the capability to be mounted on a vehicle), has a range of 1 k to 3 k and can defeat any threat armor vehicle on the battlefield. HAW is a system weighing more than 75 lbs. (needs two marines or more to be manportable and mounts on some type of vehicle), has a range of 3 k - 10 k and defeats all current and projected armor vehicles.

#### CURRENT ANTIARMOR CAPABILITIES OF THE GCE

"The Marine Corps's current LAW capability, the AT-4 and SMAW High Explosive Antiarmor (HEAA) are available to all infantry units in the GCE of the MEF. They provide the capability of destroying infantry fighting vehicles and older generation tanks without active or explosive reactive armor at a maximum range of 300 m. These systems use a simple, direct attack profile and provide alternative uses such as destroying fortifications. The AT-4 and SMAW (HEAA) phases out of the Marine Corps inventory between 2005 and 2015."8 The SMAW (HEAA) and AT-4's limited range, signature, single attack profile and limited lethality degrades their value on the current and future battlefield.

"The Marine Corps's current MAW capability, Dragon II is effective to 800 meters and defeats about 60% of the world's tanks. The Dragon II consists of three components: a day tracker (8.6 lbs.), a night tracker (32 lbs.) and a round of ammunition (28 lbs.). The total system weighs 73.2 lbs. which makes it an extremely heavy and cumbersome system for Marines to carry. The missile has limited countermeasure effectiveness with a 60- 70 % hit probability. Dragon II phases out of the Marine Corps inventory between 1998 and 2002. Dragon II's weight, single attack profile, range and limited countermeasure capability makes this weapon system ineffective



on the future battlefield."9

"The Marine Corps's current HAW capability, TOW2A/B has a maximum range of 3,750 m. TOW2A is a tandem shape charge utilizing the direct attack profile and TOW2B utilizes the top attack profile. TOW2B can defeat all current and projected threat armor with ERA."10 TOW has been in service since the early 1970's and has gone through four major upgrades since its fielding. TOWs thermal capability and lethality were combat multipliers during the Persian Gulf War. Although TOWs lethality can take us into the immediate future, survivability of this system on the future battlefield is very inadequate. TOWs backblast creates a huge signature that identifies to the enemy where to bring his fires to bear. The future development of tank ammunition will extend the maximum effective range to over 4k (140mm gun) which denies TOWs survivability standoff range. The age of this system and support equipment has created a multitude of maintenance problems that hampers readiness. "The TOW readiness rate on the average varies between 82% - 89% Marine Corps wide."11

Tow units first appeared in the FMF in the Anti-Tank (TOW) Company (AT Company) located in the tank battalion. The company had 72 systems organized into three platoons with 24 systems each. Each platoon had three sections with four squads (two systems per squad) for a total of eight systems. This structure succeeded because of a consolidated maintenance effort, standardized training and the use of habitual relationships for deployment and employment. Each platoon had a habitual relationship with a regiment and each section out of that platoon had a habitual relationship with a battalion within the regiment.

In the early 1980's, the Marine Corps procured additional TOW systems and formed a TOW platoon at each regiment. This additional fire power enhanced the GCE commander's deployment and employment options threefold. Again, habitual relationships and cross training occurred between the regimental TOW platoons and the AT Company because of the expertise located in the AT Company. In 1992, force reduction caused the elimination of the AT Company headquarters and a redistribution of the companies TOW systems throughout the division. Table 1

and 2 summarize this redistribution. Tables 1 and 2 reflect a notional division with three regiments.

***TOW ASSETS WITHIN THE NOTIONAL DIVISION BEFORE 1992 (TABLE 1)***

<b>Location</b>	<b>Number of Systems</b>	<b>Organization Structure</b>
<b>Antitank TOW Company Tank Battalion</b>	(72) in a company, (24) in a platoon, (8) in a section	(3) platoons, each platoon has (3) sections, each section has (4) squads
<b>Regimental Tow Platoon Infantry Regiment</b>	(24) in a platoon, (8) in a section	each platoon has (3) sections with 4 squads
<b>Antiarmor section LAI Battalion</b>	(12) in a battalion (3) in a company	(1) section, (1) squad in each company

**TOTAL NUMBER OF SYSTEM 156**

***TOW ASSETS WITHIN THE NOTIONAL DIVISION AFTER 1992 (TABLE 2)***

<b>Location</b>	<b>Number of systems</b>	<b>Organization structure</b>
<b>H+S TOW Platoon and Scout platoon, Tank BN</b>	(24) in a platoon, (8) in a section, (2) systems in the scout platoon.	Each platoon has (3) sections, each section 4 squads
<b>Antiarmor Section, Weapons Co, Infantry BN</b>	(8) in a section, (4) in a squad	Each section has (4) squads
<b>Antiarmor Section Weapons Co, LAI BN</b>	(12) in a section, (3) in a squad	Each section has (4) squads
<b>Regimental TOW Platoon, Infantry Regiment</b>	(24) in a platoon, (8) in a section	Each platoon has (3) sections, each section (4) squads

**TOTAL NUMBER OF SYSTEM 182**

Table 2 shows the total number of assets within the division increased by 26 systems. This increase occurred because 3rd Tank Battalion distributed 72 systems throughout the Corps upon deactivated in 1992. After 1992, the key component missing in the TOW organization is the (C2) structure that was the expertise within the division, the Anti -Tank (TOW) Company Headquarters. This C2 was the center of gravity for all the other TOW units within the division.

The absence of this structure has caused some difficulties in training , maintenance, and employment options.

Training a TOW unit is a difficult task because of the lack of doctrinal sources available. There is sufficient doctrine on tactical employment but very little on how to train a TOW crewman. In the past, the best source of material to answer the "how" was the AT Company Standard Operating Procedures (SOP). In 1991, all the AT Companies located in the tank battalions developed a standardized training SOP. In 1992, the infantry regiments received this SOP in the hope that all TOW units would train to the standards set forth in the SOP.

The training standards within this SOP encompassed a variety of doctrinal sources from the army and professional articles. An example from this SOP is the TOW Crew Gunnery Skills Test (TCGST). A TCGST is a series of TOW specific skills common to every TOW crewman that ensures that crew's safety while firing in training and combat. An example of one of the tasks within the test is misfire procedures for the TOW missile. Common sense would tell you before a TOW crew can fire on the range the crew must pass a TCGST. After interviewing a variety of TOW personnel from all four divisions I was shocked at the number of TOW crewman who hadn't taken a TCGST or for that matter any other test before firing. This is a good example of a lack of C2 that could be a fatal mistake in the future.

Currently, TOW units are spread throughout the division in small units attached to headquarters elements who train a multitude of Military Occupational Specialties (MOSs). Currently most TOW unit leaders have less than 3 years experience on the weapon system. Most of the Non commission Officer's (NCO's) have more experience than their section leaders or platoon sergeants. The reason for this is after the rank of sergeant there isn't any distinction on whether an individual has had TOW experience. The section leader and platoon sergeant line numbers in a TOW section and platoon rate an 0369 (infantryman). This situation existed in the AT Company but the inexperienced section leader could learn from the experienced section leader in the unit

Standardized training and expertise within the AT Company provided the foundation from which all could learn. Currently this foundation exists only within the senior NCOs who were once a part of the AT Company. To improve TOW unit training, the Marine Corps should consolidate TOW into one unit with the old C2 structure from Table of Organization (T/O) 4235M. Another solution would be to publish a TOW handbook or FMFM that all units must follow. The best sources to create such a handbook would be the Army's Individual Skills TOW Crewman Handbook, the MCRES standards for the TOW crewman, and the AT Company SOP published in 1991.

"Maintenance on the TOW weapon system is a difficult and time consuming process. The fact that it takes six different pieces of test equipment to support the TOW is a problem. An extreme amount of equipment for one system."12 Add to this an inadequate amount of field test sets with extensive calibration requirements and this presents an overwhelming challenge to a young Staff Sergeant or Lieutenant. To compound this challenge, we have inexperienced optic repairman trying to maintain both the TOW system and the field test set. Since the Marine Corps consolidated the (2171) MOS (optic repairmen), the optic repairmen comes out of school with only a general knowledge of all optics. The repairman then learns to repair a specific piece of equipment after assignment to a unit. This is a problem because when that optic repairman receives an assignment to a tow section in the infantry battalion he will be the only one (current staffing goal in the fleet).

A solution to this problem again is to reconstitute the AT Company or consolidate maintenance at the regiment. The advantage of reconstituting the AT Company is the TOW maintenance section under T/O 4235M has 24 less structure spaces than the maintenance sections in the three regimental TOW platoons and the TOW platoon located in tank battalion. Consolidation of maintenance into one unit will provide a streamlined maintenance system that will enhance the following: (1) Availability of all field test sets within the division which in turn allows for a standardized calibration program; (2) Consolidation of all repairman which allows the experienced

repairman to teach the inexperienced; (3) In the long term, increase readiness and save money.

The command and control capacity of the AT Company in the past gave the GCE commander considerable flexibility in determining how to best employ his antiarmor assets. The options available were: (1) to employ the AT Company without modification; (2) attach or OPCON one or more AT platoons or sections to other maneuver elements to enhance the combat power of that element; (3) assign other units to the AT Company such as tanks and infantry to become a security force to perform screen, guard and cover missions. Without the AT Company C2, the GCE commander can only employ sections or platoons. If the GCE command wants to mass his antitank assets he has to form the C2 structure adhoc.

Recommendation: The AT Company C2 structure advantages clearly outweigh the disadvantages. The main disadvantage is the additional structure requirements (2 Officers and 13 enlisted) in a time when the Marine Corps is reducing structure. In this situation, the Marine Corps reduced C2 structure without looking at the repercussions of the loss of that C2 structure as it applies to readiness and employment. My proposal is to reconstitute the AT Company at the same time the Marine Corps fields the Javelin. In 1997, once fielding of the Javelin is complete; there will be four platoons of Tow in the division. These will be the three platoons located in the regiments and the platoon located in the tank battalion.( The TOW section structure in the infantry battalion will be used to employ Javelin). The company structure will be T/O 4235M with an additional platoon (Annex A). The company would have a four platoon based structure with 96 TOW weapon systems. The maintenance section would require three additional 2171's and two 3521's (motor transport repairmen) because of the extra platoon within the company. A closer look at the maintenance sections within the regimental TOW platoons and the platoon located in the tank battalion reveals the maintenance section in T/O 4235M reduces (11) 3521 structure spaces and (13) 2171 structure spaces even with the additional maintenance billets required for the fourth platoon.

This proposal offers a solution to a problem created in 1992, the elimination of C2 within the Marine Corps's HAW capability (TOW). This structure provides the following advantages: (1) A standardized training environment; (2) A consolidated maintenance effort to increase readiness and reduce cost on an aging weapon system; (3) Provides the GCE commander the flexibility to employ his antiarmor assets with a C2 capacity already established. The disadvantage, of course, is the additional structure required.

The AT Company should be under the Tank Battalion Commander, the armor adviser to the Division Commander. Experience has provided this recommendation all the justification needed. In this situation, 28 years of experience on the TOW weapon system exists in the tank battalions of the Marine Corps. Add to this expertise the maintenance structure that exists within the tank battalion, especially in the MOSs of optic repairman and motor transport and one has a practical solution. There are other options available such as consolidation at the division or regimental level. The disadvantages to these options are the lack of experience and limited maintenance capabilities of these units.

#### FUTURE ANTIARMOR CAPABILITIES OF THE GCE

"The Short Range Antitank Weapon (SRAW) now called the Predator is the projected LAW capability of the GCE. Predator has been under development since 1990. Predator is a "soft launch" (missile can be fired from an enclosed area because of reduced backblast) , "fire and forget" (gunner does not have to track the missile after firing), man portable (weighs less than 20 lbs.) system. Predator has a range of 600 m (increase of 300 m over the AT-4) and has a multiple attack profile. The definition of multiple attack profile is a weapon system that has a top attack and direct attack profile. Predator has a modular front end so it can fire an antiarmor missile or a Multi-Purpose Individual Munitions (MPIM). Predator can defeat MBTs equipped with explosive reactive armor. Predator's increased lethality and flexibility will significantly enhance the combat effectiveness of infantry units and supplement the firepower of medium and heavy antitank weapons."13

The fielding of Predator will occur in the year 2000. Twenty-four systems will be located in the Antiarmor Platoon of the infantry battalion. The structure that will be used is the Dragon Platoon that currently has 24 two man teams. Since the Predator is a one man system, the structure of the Dragon Platoon will be reduced by half, a total of 624 structure spaces will be eliminated. The current T/O has three section leaders in the Dragon Platoon that could employ three sections with 8 teams. The new T/O calls for one section leader with 12 teams (two systems per team). I think this structure reduces employment options and has insufficient leadership for combat and training. I strongly recommend two section leaders be added to the new T/O. The Marine Corps will still reduce 576 structure spaces but increase C2, technical proficiency, employment options (3 sections with 4 teams) and training.

The future LAW capability within the GCE is a good example of advance technology being able to reduce personnel (structure) and increase lethality. Here again, the Marine Corps needs to reevaluated the repercussions of the reduction in structure as applies to readiness and employment. We must be cautious about how much leadership structure we reduce because advance technology usually requires strong C2 both in training and combat.

"The Javelin, previously known as the Advanced Antitank Weapon System Medium (AAWS-M) is being developed as the future MAW capability of the GCE. Javelin is a "soft launch", "fire and forget", system with multiple attack profiles that is effective against modern and projected armor vehicles at ranges exceeding 2000 m. The Javelin features a modular design to provide growth potential to address projected threat upgrades in protection. Javelin has an integrated day / night (thermal) capability and is effective in countermeasure environments."14 "At 49.5 lbs. the Javelin is a great improvement over the 73.2 lbs. Dragon II. The Javelin has two components: A Command Launch Unit (CLU) (14.1 lbs.) and a round of ammunition (32.8 lbs.). The survivability (fire and forget and soft launch) and lethality (range more than 2000 meters and multiple attack profile) crosses the spectrum in terms of lethality and range between the current

MAW and HAW capability. The Javelin provides the infantryman the means to attack, kill, and survive on the combined arms battlefield of the future."15

Cost and a misconception that this system is a HAW capability on the future battlefield are Javelin's limitations.. "In 1989, cost of the CLU was 50, 000 dollars per unit. Cost of a missile was 41,000 dollars. Currently the CLU price is 176,000 dollars per unit and the missile is 70,000 dollars. The additional cost resulted from cost overruns associated with the development and testing of the Focal Plane Array (FPA) guidance system. FPA technology incorporates imaging infrared sensors and in-flight tracking capabilities with a resulting fire and forget capability."16 Javelin procurement has been reduced 67% to provide a fundable alternative and sustain the program. The current plan will field 8 systems to each infantry battalion in 1997. This is a "bare bones" plan from the original 24 systems.

The structure that will be used to employ this system is the TOW section in the antiarmor platoon. Javelin requires the exact structure currently employing the TOW weapon system and can be mounted in a TOW pedestal with an adapter kit. This is where the second limitation of misconception is created. The average Marine, because of the employment structure (TOW section) and additional range, perceives Javelin as a replacement for TOW. As previously mentioned, the HAW capability of the future needs to have a range of 4-6 k. Javelin currently has the lethality and survivability characteristics for the future battlefield but not the range.

The TOW system reaches the end of its service life in 2009. Currently the Marine Corps has not identified a replacement for the TOW system. The replacement for TOW must be a system that increases survivability of the crew. As previously mentioned, to increase survivability of the crew the replacement system must have a maximum range of 4-6k and incorporate FPA. This system must have the latest technology in counter missile capability and have a modular design to provide growth potential to address projected threat upgrades in protection. Currently there are four systems available to meet these requirements: Enhanced TOW (ETOW), Extended Javelin (ER Javelin), Line-of-Sight Anti-Tank (LOSAT), and Non Line-of-Sight Anti-Tank



(NLOS).

"Enhanced TOW (ETOW) will have a maximum effective range of 4-6 k. This system can either have a longer wire or incorporate FPA. ETOW will have a second generation thermal imager with an improved target acquisition and fire control system. ETOW will be completely compatible with our current TOW system. Although an estimated cost is unknown the manufacturer has stated that the price of ETOW with a longer wire will be less than any other system on the market. ETOW with FPA will be more expensive but still less than most systems on the market. ETOW will still use the cumbersome six pieces of test equipment. ETOW currently will not have a soft launch capability. ETOW's lethality will not develop much passed the current TOW 2B missile."<sup>17</sup> Although this technology can defeat all current threat armor vehicles, there are some questions on how much growth potential this system has against upgraded threat protection. ETOW is cost effective, and lethal but is deficient in maintenance equipment and crew survivability (not having a soft launch capability). If the Marine Corps decides to procure ETOW we must purchase FPA. ETOW with just a longer wire doesn't offer anything more than improved standoff range in the area of TOW crewman survivability.

"Extended Range Javelin (ER Javelin) offers all the capabilities of the Javelin. ER Javelin has a range of 4-6 k. ER Javelin is compatible with both Javelin and TOW. If the Marine Corps procures ER Javelin the manufacturer has guaranteed a 30% reduction in cost of the overall Javelin program."<sup>18</sup> Estimated cost of the system is 300,000 dollars per weapon system. Since ER Javelin is completely compatible with Javelin the purchase of ER Javelin gives the Corps the flexibility to put a upgraded HAW capability back in the infantry battalion. ER Javelin is a cost effective solution that provides a substantial upgrade in survivability and lethality.

"Line-of-Sight Anti-Tank (LOSAT) is a mobile, direct fire, antitank system that provides overwhelming lethality. The LOSAT weapon system consists of a Kinetic Energy Missile (KEM) launcher mounted on an armor combat vehicle chassis. LOSAT's second generation FLIR fire

control system supports recognition beyond the KEM's maximum effective range of 10 k. LOSAT acquires, tracks and engages multiple targets while in defilade. Currently, the Army has a proposal to outfit their light infantry divisions with LOSAT mounted on the assault gun chassis. LOSAT is a giant leap in technology. The lethality of this weapon system is unmatched on the battlefield. The problem with this weapon system is cost. The missile and fire control system alone cost 1.3 million dollars.<sup>19</sup> The cost of a chassis must be added to 1.3 million dollars for total cost..

Currently, the Marine Corps can mount LOSAT on the Light Armor Vehicle (LAV), M1A-1 (tank) or the Advance Amphibious Assault Vehicle (AAAV) chassis. I propose the chassis should be the AAAV for deployability reasons. Mounted on a AAAV this weapon system can come over the horizon without the aid of any ship to shore vehicle. Cost will probably deter the Corps from procuring this system. The estimated cost for LOSAT mounted on AAAV is 2.8 million dollars per vehicle.

Non Line-of-Sight Antitank is a 120mm mortar round with a range of 8-10 k. This antitank mortar can use the mortar being developed for the Marine Corps now or use a turret mounted on an AAAV. This system is lethal and offers the utmost protection to the crew. Estimated cost of this system is approximately the same cost as LOSAT if the Corps chooses the turret version on the AAAV.

Recommendation: The Marine Corps should pursue a joint acquisition with the army to develop and field ER Javelin. ER Javelin offers the survivability needed on the future battlefield because of its soft launch and "fire and forget" technology. ER Javelin's modular design provides the growth potential to address projected threat upgrades in protection. ER Javelin's compatibility to our current TOW system offers the flexibility to use our current structure or the structure suggested in this paper. ER Javelin provides the opportunity to put a HAW capability back in the antiarmor platoon of the infantry battalion. The overall cost savings of the Javelin program guaranteed by the manufacturer establishes this proposal as the most cost effective means

available. Since the Marine Corps fights as a MAGTF, the Marine Corps should concurrently pursue a joint research and development program to develop LOSAT and NLOS. Although the cost is extreme, I envision the MAGTF of 2015 needing a combination of all three systems in some cost effective quantity.

Future conflict of any spectrum will still have armor as the decisive force in ground combat. Free trade and open armor market competition have created a mix-and-match technology main battle tank with drastic improvements in survivability. Many countries have acquired these tanks in large quantities. In recent years, force reductions have caused the Marine Corps to reduce C2 structure without considering the repercussions of the absence of this structure as it applies to readiness and employment. The GCE's future LAW and current HAW structures provide excellent examples of this situation. The cost of future technology forced the Marine Corps to take a "bare bones" approach to acquire and field the GCE's future antiarmor capability. This approach created a large void in the future HAW capability of the GCE. The GCE in future conflict must have the capability to defeat large quantities of advance technology main battle tanks with drastic improvements in survivability. Currently, the Marine Corps can not counter this threat when one specifically analyses the command and control, survivability and lethality of the current HAW capability within the GCE.

To overcome current command and control problems in the HAW capability the Marine Corps needs to consolidate (TOW) within the GCE. The reconstitution of the AT Company in FY-97 will increase readiness, standardize training, and be cost effective in the long term. This structure also provides a base structure for future weapon systems. To correct the dilemma in the future HAW capability, the Marine Corps should pursue a joint acquisition with the Army to develop and field Extended Range Javelin (ER Javelin) as the replacement for TOW. Joint acquisition and fielding of ER Javelin are the cost effective means to ensure the lethality and survivability required on the future battlefield. The Marine Corps concurrently should establish a joint research and

development program with the Army to develop LOSAT and NLOS. These systems  
overwhelming lethality ensure a technological advantage for the future MAGTF.

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**IMAGES THAT APPEAR WITH DOCUMENT**